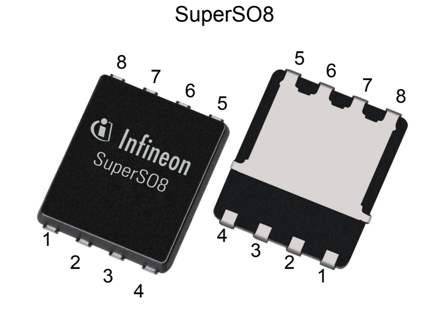
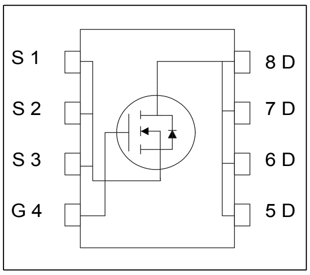
MOSFET

OptiMOS™ 5 Power-Transistor, 100 V



Features

- Optimized for high performance SMPS, e.g. sync. Rec.
- 100% avalanche tested
- Superior thermal resistance
- N-channel, logic level
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21



Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	100	V
$R_{DS(on),max}$	14.6	mΩ
I_D	44	A
Q_{oss}	20	nC
Q_G(0V..4.5V)	7.6	nC

Type / Ordering Code	Package	Marking	Related Links
BSC146N10LS5	PG-TDSON-8	146N10LS	-

Table of Contents

1 Maximum ratings

at T_A=25 °C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current[1]	I_D	- - -	- - -	44 28 10	A	V_{GS}=10 V, T_C=25 °C V_{GS}=10 V, T_C=100 °C V_{GS}=10 V, T_A=25 °C, R_{THJA}=50 °C/W[2]
Pulsed drain current[3]	$I_{D,pulse}$	-	-	176	A	T_A=25 °C
Avalanche energy, single pulse[4]	E_{AS}	-	-	30	mJ	I_D=20 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	- -	- -	52 2.5	W	T_C=25 °C T_A=25 °C, R_{THJA}=50 °C/W[3]
Operating and storage temperature	T_j, T_{stg}	-55	-	150	°C	IEC climatic category; DIN IEC 68-1: 55/150/56

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	1.4	2.4	°C/W	-
Device on PCB, 6 cm² cooling area[2]	R_{thJA}	-	-	50	°C/W	-

[1] Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature at 25°C. For higher case temperature please refer to Diagram 2. De-rating will be required based on the actual environmental conditions
[2] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.
[3] See Diagram 3 for more detailed information
[4] See Diagram 13 for more detailed information

3 Electrical characteristics

at T_j=25 °C, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	100	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	1.1	1.7	2.3	V	V_{DS}=V_{GS}, I_D=23 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	1 100	µA	V_{DS}=100 V, V_{GS}=0 V, T_j=25 °C V_{DS}=100 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	10	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- -	12.2 15.8	14.6 20.8	mΩ	V_{GS}=10 V, I_D=22 A V_{GS}=4.5 V, I_D=11 A
Gate resistance[1]	R_G	-	1	1.5	Ω	-
Transconductance	g_{fs}	19	38	-	S	$\|V_{DS}\|\geq 2\|I_D\|R_{DS(on)max}$, I_D=22 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance[1]	C_{iss}	-	1000	1300	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Output capacitance[1]	C_{oss}	-	170	220	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Reverse transfer capacitance[1]	C_{rss}	-	9	15	pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	5	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=22 A, $R_{G,ext}$=3 Ω
Rise time	t_r	-	3	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=22 A, $R_{G,ext}$=3 Ω
Turn-off delay time	$t_{d(off)}$	-	14	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=22 A, $R_{G,ext}$=3 Ω
Fall time	t_f	-	3	-	ns	V_{DD}=50 V, V_{GS}=10 V, I_D=22 A, $R_{G,ext}$=3 Ω

Table 6 Gate charge characteristics[2]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	3.3	-	nC	V_{DD}=50 V, I_D=22 A, V_{GS}=0 to 4.5 V
Gate charge at threshold	$Q_{g(th)}$	-	1.7	-	nC	V_{DD}=50 V, I_D=22 A, V_{GS}=0 to 4.5 V
Gate to drain charge[1]	Q_{gd}	-	2.8	4.2	nC	V_{DD}=50 V, I_D=22 A, V_{GS}=0 to 4.5 V
Switching charge	Q_{sw}	-	4.4	-	nC	V_{DD}=50 V, I_D=22 A, V_{GS}=0 to 4.5 V
Gate charge total[1]	Q_g	-	7.6	10	nC	V_{DD}=50 V, I_D=22 A, V_{GS}=0 to 4.5 V
Gate plateau voltage	$V_{plateau}$	-	3.3	-	V	V_{DD}=50 V, I_D=22 A, V_{GS}=0 to 4.5 V
Gate charge total, sync. FET	$Q_{g(sync)}$	-	13	-	nC	V_{DS}=0.1 V, V_{GS}=0 to 10 V
Output charge[1]	Q_{oss}	-	20	27	nC	V_{DS}=50 V, V_{GS}=0 V

[1] Defined by design. Not subject to production test.
[2] See "Gate charge waveforms" for parameter definition

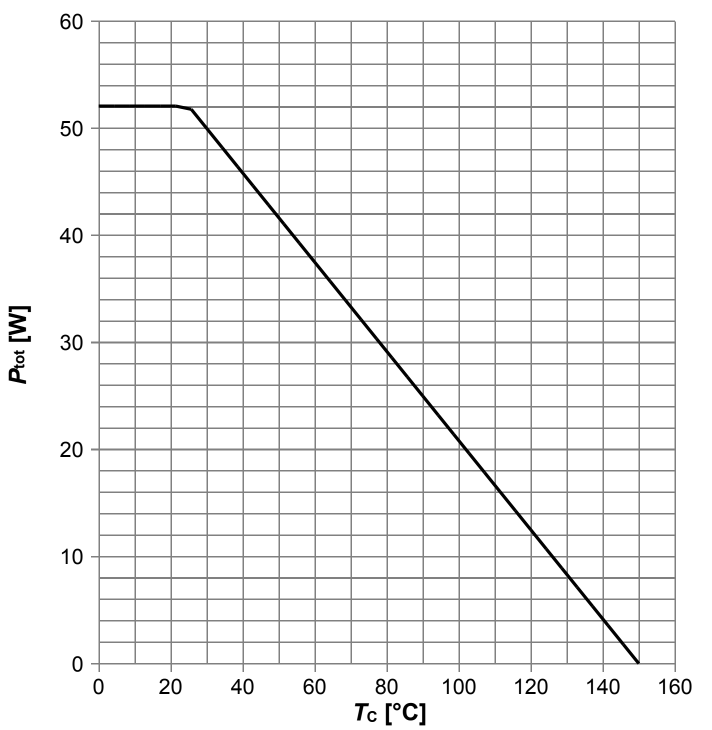
Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	44	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	176	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	0.9	1.1	V	V_{GS}=0 V, I_F=22 A, T_j=25 °C
Reverse recovery time[1]	t_{rr}	-	26	52	ns	V_R=50 V, I_F=22 A, di_F/dt=100 A/µs
Reverse recovery charge[1]	Q_{rr}	-	19	38	nC	V_R=50 V, I_F=22 A, di_F/dt=100 A/µs

[1] Defined by design. Not subject to production test.

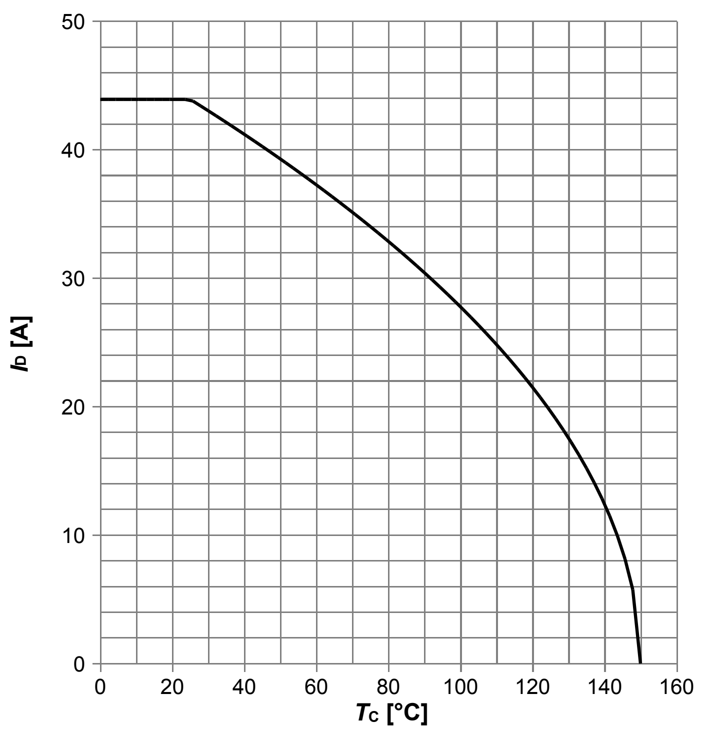
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



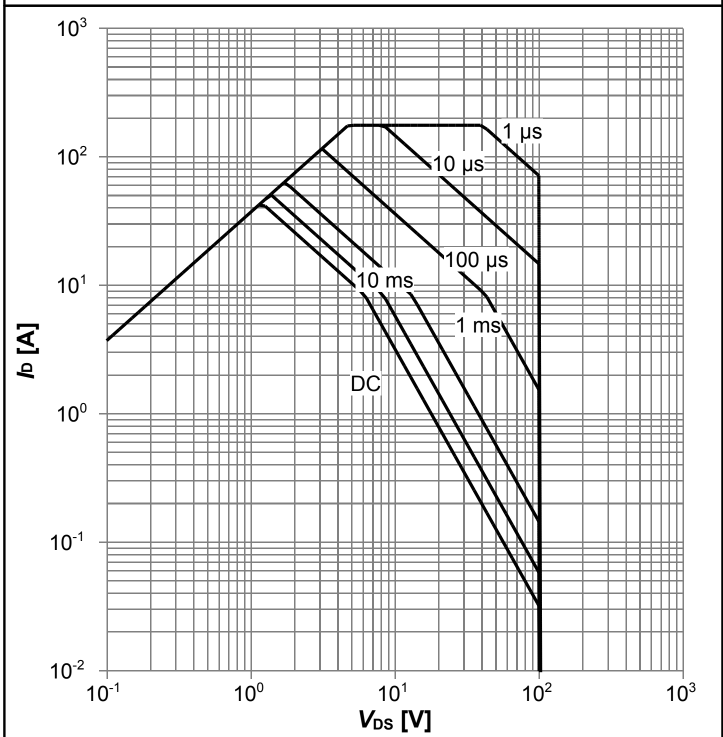
P_{tot}=f(T_C)

Diagram 2: Drain current



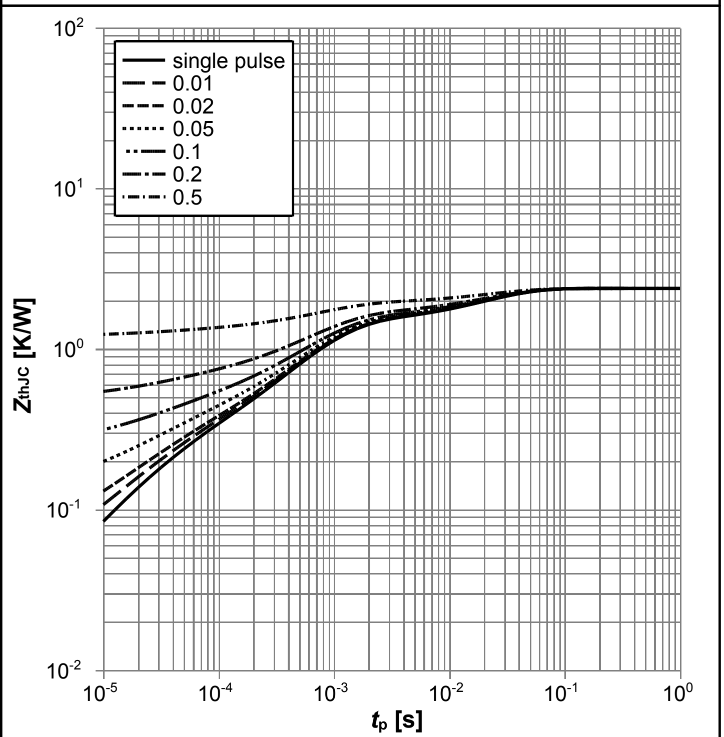
I_D=f(T_C); V_{GS}≥10 V

Diagram 3: Safe operating area



I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



Z_{thJC}=f(t_p); parameter: D=t_p/T

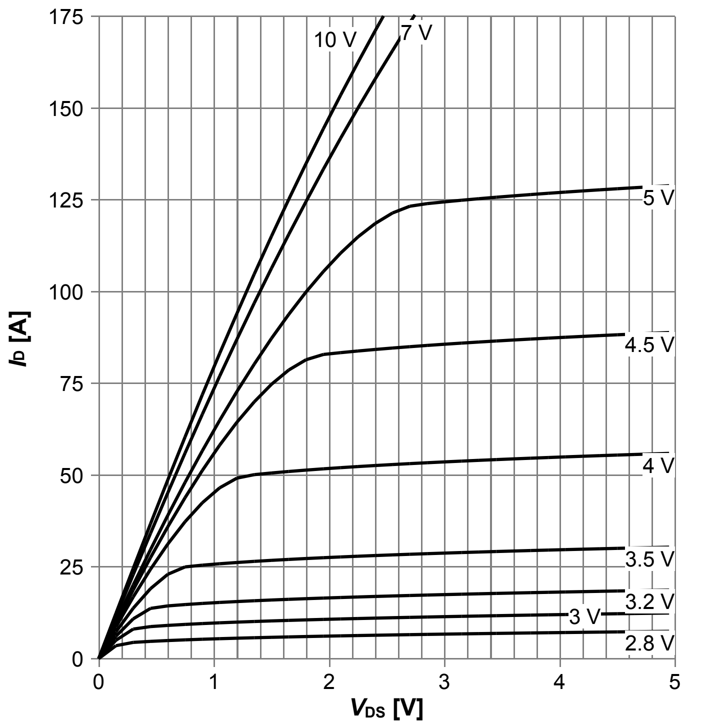
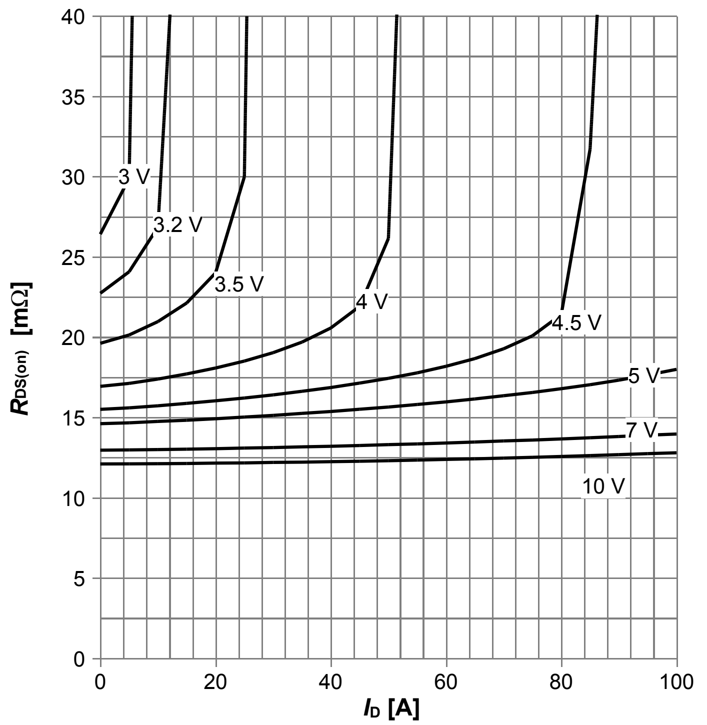
Diagram 5: Typ. output characteristics	Diagram 6: Typ. drain-source on resistance
	
I_D=f(V_{DS}), T_j=25 °C; parameter: V_{GS}	$R_{DS(on)}$=f(I_D), T_j=25 °C; parameter: V_{GS}

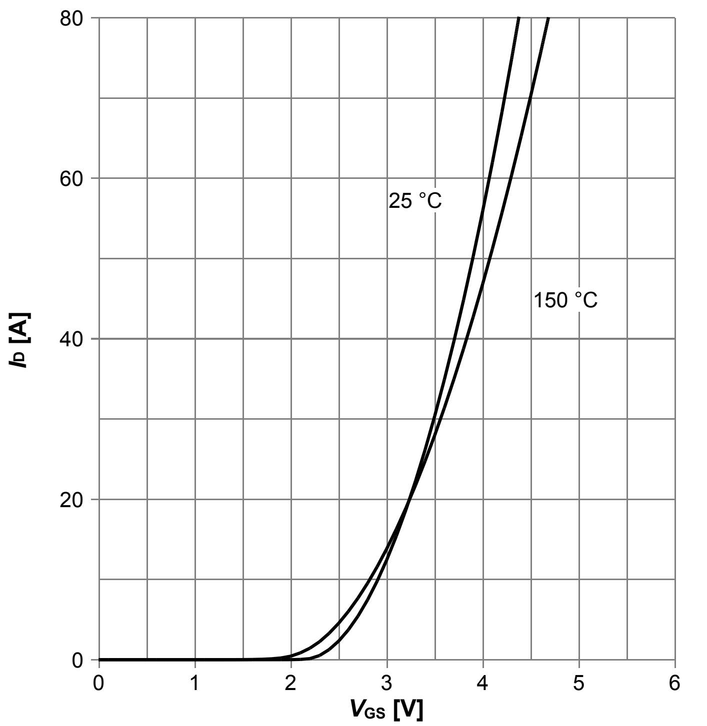
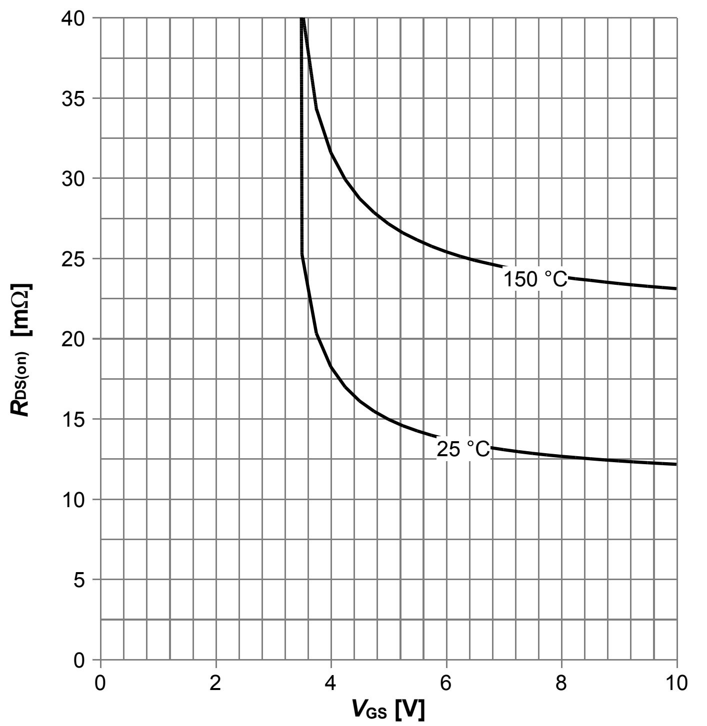
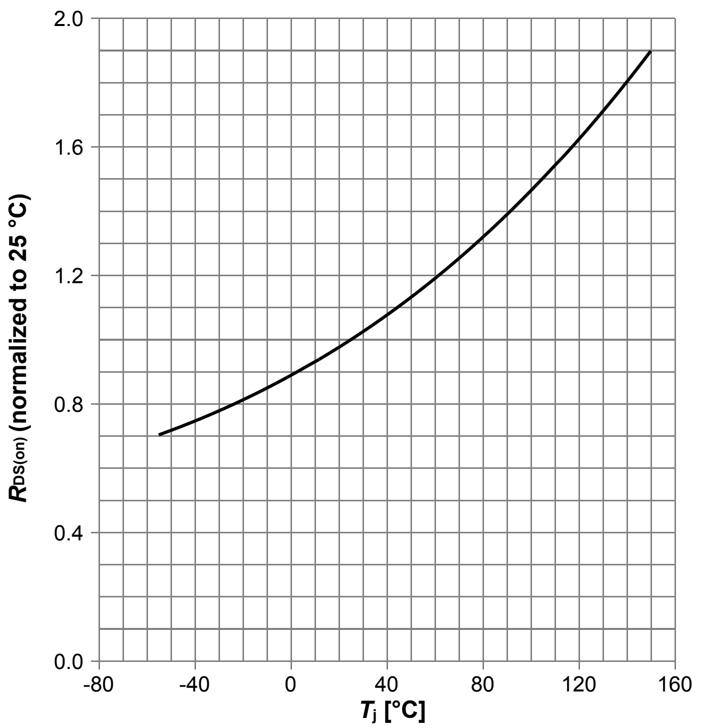
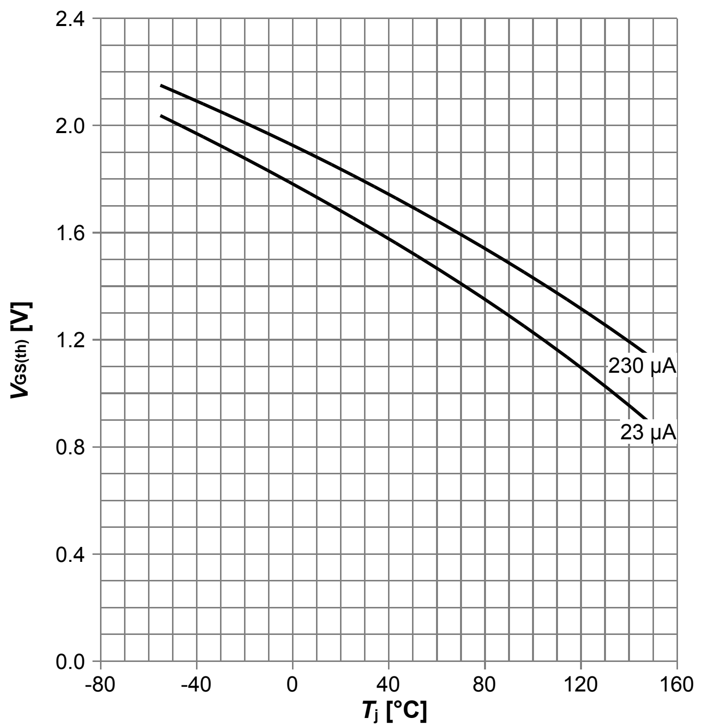
Diagram 7: Typ. transfer characteristics	Diagram 8: Typ. drain-source on resistance
	
I_D=f(V_{GS}), $\lvert V_{DS}\rvert$>2$\lvert I_D\rvert R_{DS(on)max}$; parameter: T_j	$R_{DS(on)}$=f(V_{GS}), I_D=22 A; parameter: T_j

Diagram 9: Normalized drain-source on resistance



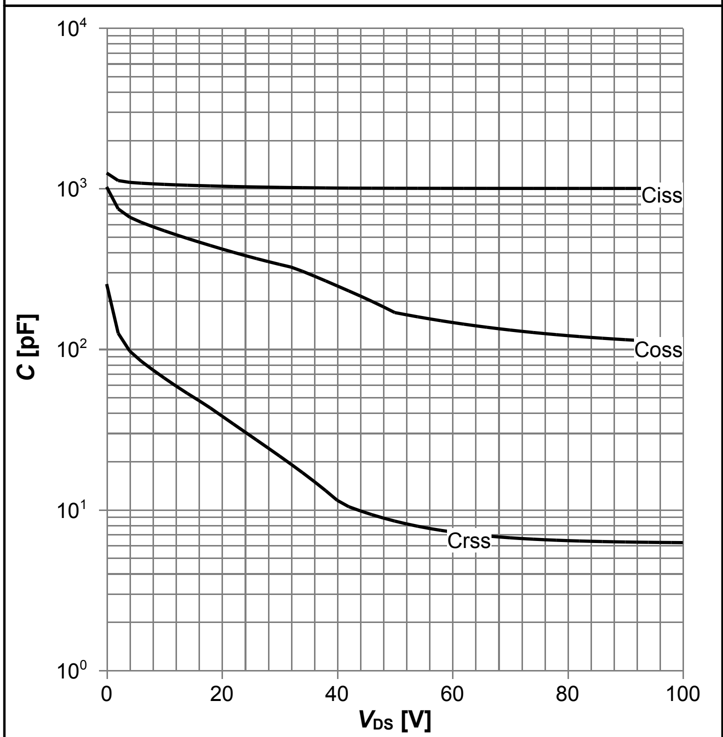
$R_{DS(on)}$=f(T_j), I_D=22 A, V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



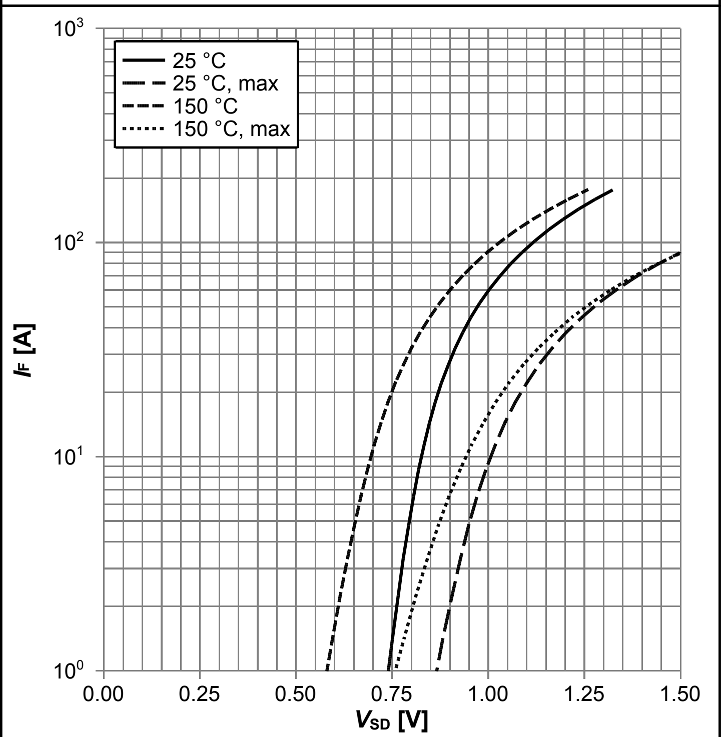
$V_{GS(th)}$=f(T_j), V_{GS}=V_{DS}; parameter: I_D

Diagram 11: Typ. capacitances



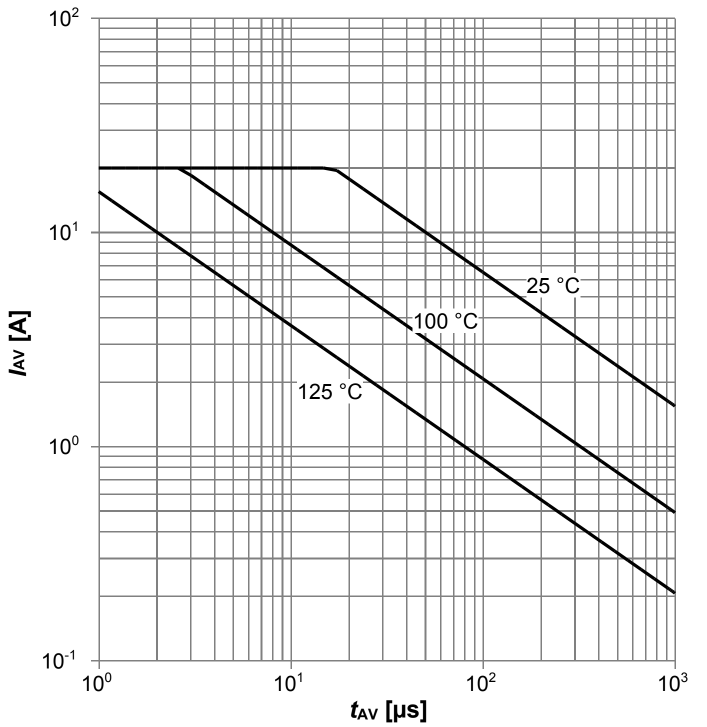
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



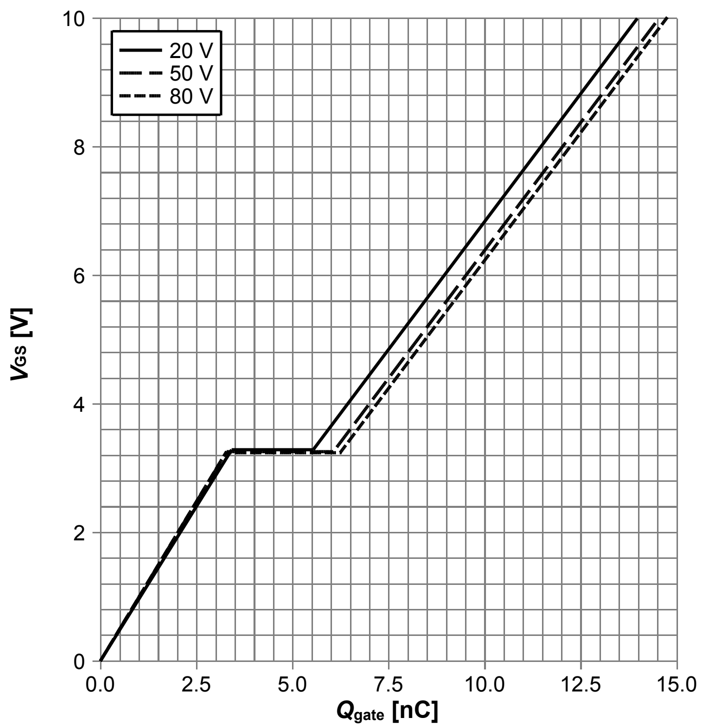
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



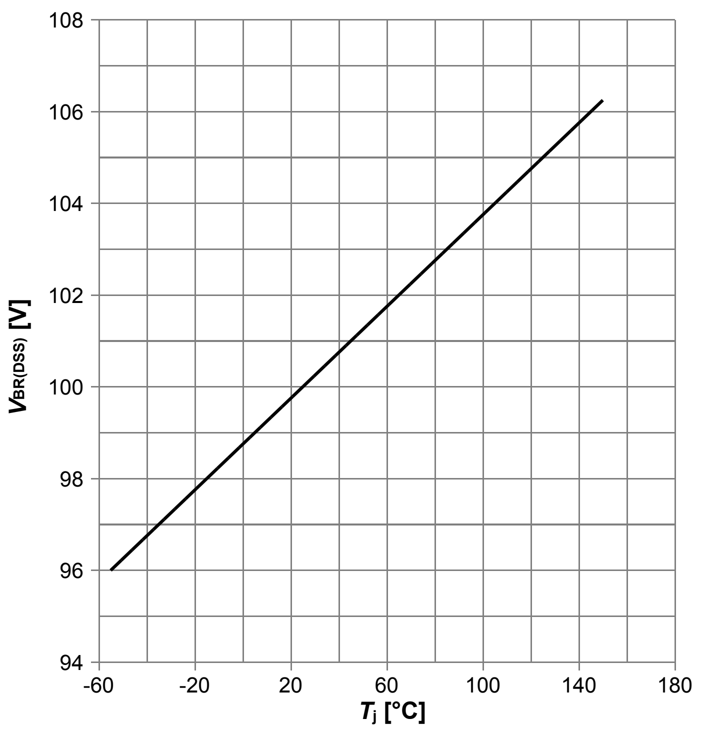
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



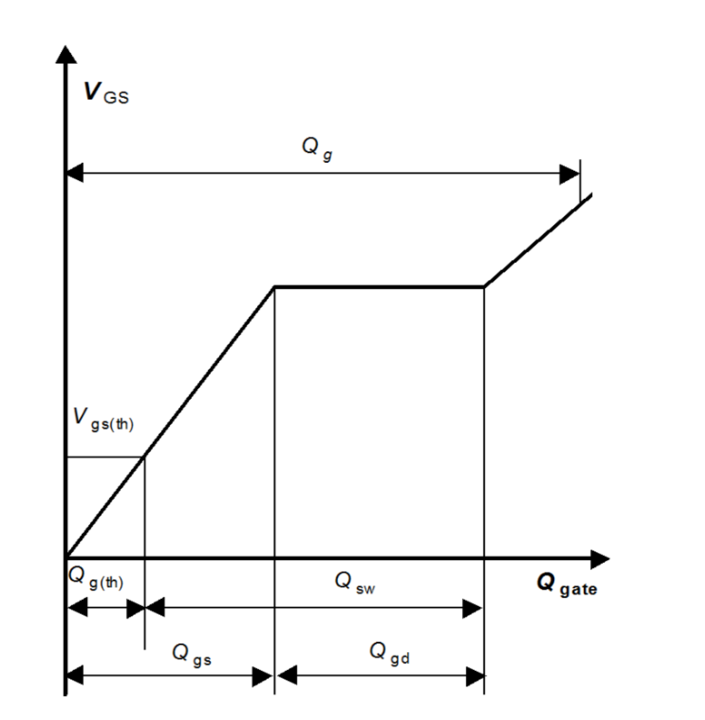
V_{GS}=f(Q_{gate}), I_D=22 A pulsed, T_j=25 °C; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

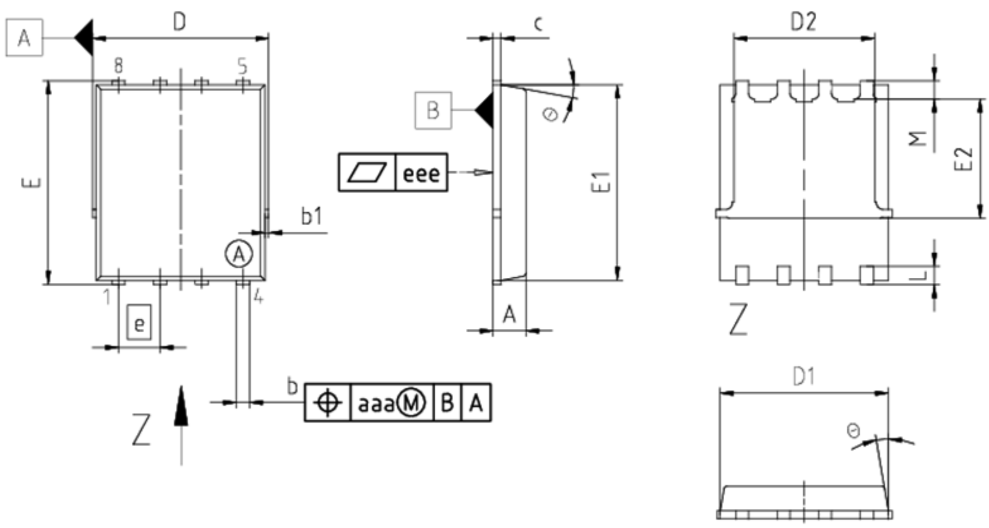


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Diagram Gate charge waveforms



5 Package Outlines



DIM	MILLIMETERS	
	MIN	MAX
A	0.90	1.10
b	0.31	0.54
b1	0.02	0.22
c	0.15	0.35
D	5.15	5.49
D1	4.95	5.35
D2	3.70	4.40
E	5.95	6.35
E1	5.70	6.10
E2	3.40	3.80
e	1.27	
N	8	
L	0.45	0.71
M	0.45	0.75
Θ	8.5°	12°
aaa	0.25	
eee	0.08	

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Figure 1 Outline PG-TDSON-8, dimensions in mm

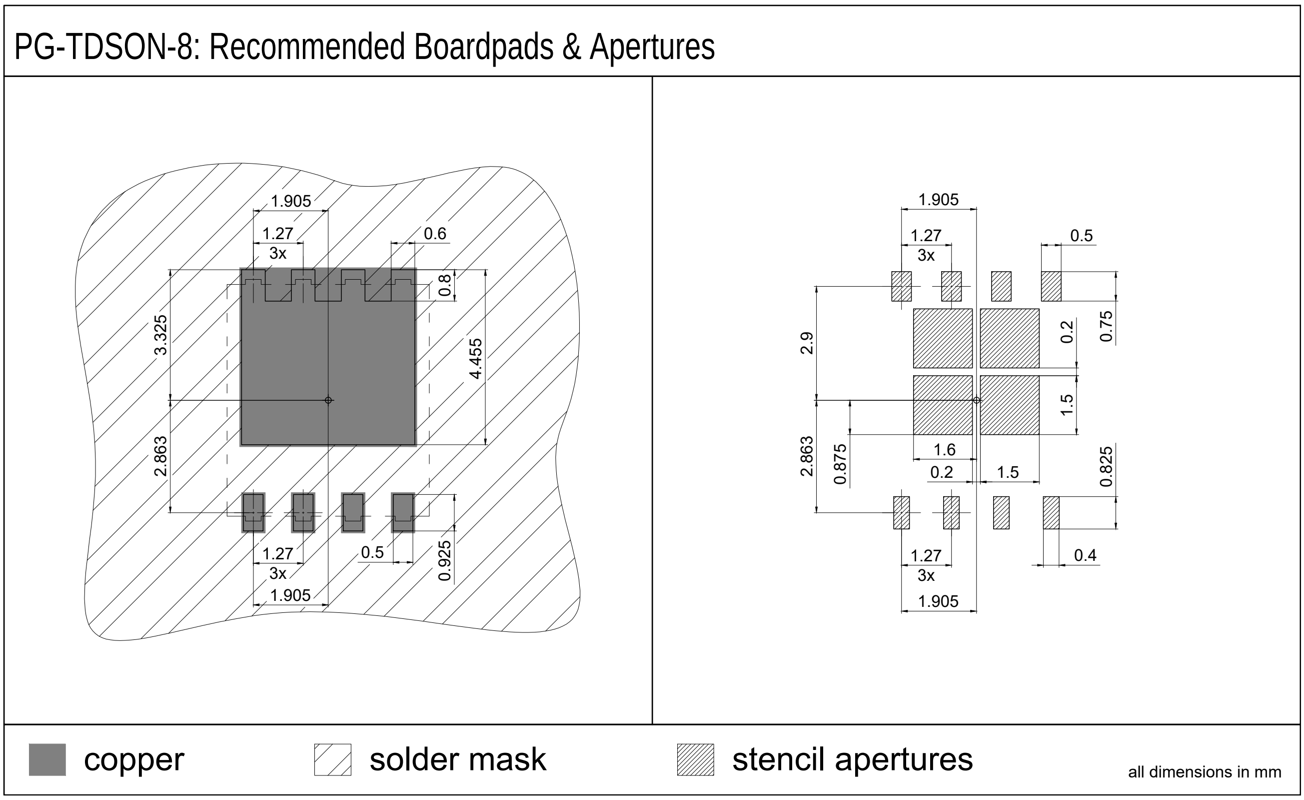

Figure 2 Outline Boardpads (TDSON-8), dimensions in mm

Revision History

BSC146N10LS5

Revision: 2020-08-06, Rev. 2.3

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2016-09-30	Release of final version
2.1	2019-05-10	Update Rg, trr, Qrr, Diagrams 5, 8 and 9
2.2	2019-05-20	Update Id pulse, Diagrams 2, 3, 12
2.3	2020-08-06	Update Max Current Rating

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